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A Revision of North American Cornaceæ. I.

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The term "North American" implies the customary limitation north of Mexico, an unnatural one, but necessary in the present state of our information.

The three genera of this order represented in North America are so different from each other that they have often been separated into as many orders. Our purpose, however, is not to discuss their ordinal relationships, but merely to present their species. For this reason, we give no generic descriptions, but accept the genera as ordinarily understood. We are greatly indebted to the following persons, who promptly put at our disposal the collections which they own or have in charge: Dr. Sereno Watson, Dr. George Vasey, Professor E. L. Greene, Professor John Macoun, Mr. John Donnell Smith, and Mr. J. C. Martindale.

Under each species the general range is first given, followed by a list of collectors whose material we have examined. This fact should be clearly understood, as an exhaustive list of stations and collectors is not intended. It was thought better to include only those specimens that had passed under our observation, and so avoid all possible confusion.

CORNUS Tourn.—The involucrate and non-involucrate flower-clusters furnish the first and most evident grouping of the species. The non-involucrate species are the most perplexing, and in several instances evidently intergrade. Among them the character of the pubescence is very important, being straight and appressed or silky. In the former case the hairs are attached at or near the middle, are very stiff and more or less tuberculate-roughened, and are characteristic of the genus. Such hairs are almost universally found upon the upper leaf-surfaces of *Cornus*, but upon the under surfaces they may be replaced by a loose and silky pubescence, which is attached near one end, and is not rigid or tuberculate. As is to be expected, both forms of pubescence may occasionally be found upon a lower leaf-surface, but these characters are generally quite constant. The stones, in most cases, furnish excellent specific characters, though in some species they are so exceedingly variable (notably so in *C. stolonifera*) that they can only be used in

a negative way. The specific relationships are in some cases quite intricate, so that they can not be expressed in a lineal arrangement. Whenever these closely related species overlap in range, many puzzling intermediate forms are found, but if they be accepted as such they are easily understood. At a distance from the regions of overlapping these species are as distinct as any. A notable illustration of intermingling species is to be found in the Lake Superior region, where *C. stolonifera*, *C. asperifolia*, and *C. Baileyi* exhibit many intermediate forms. Another such region is to be found along the Pacific coast, especially from Washington to Northern California, where *C. stolonifera* and *C. pubescens* intergrade. *C. glabrata* of the Pacific coast finds its Atlantic congener in *C. candidissima*, but they are so far dissociated that there is no longer any confusion. *C. stolonifera* is the species of widest range and characters, and seems to have points of contact with almost all the other non-involucrate forms.

*Flowers greenish (except in no. 2), in a close cyme or head, surrounded by a conspicuous involucre of 4 to 6 white petal-like bracts: fruit bright red.

+Low and herbaceous, from a slender creeping subterranean root-stock.

1. *C. Canadensis* Linn. Spec. 117. Stems simple, 7.5 to 20 cm. high: leaves scarcely petioled, mostly in an apparent whorl of 4 or 6 near the summit, oval, ovate, or even obovate, pointed at both ends, somewhat appressed-pubescent on both sides, 2.5–7.5 cm. long, .8 to 3.8 cm. wide; near the middle of the stem a pair of smaller leaves, and scale-like bracts below: peduncle 1.2 to 3.8 cm. long: involucral bracts 4, white or cream-color, ovate (often broadly so), 6 to 16 mm. long: fruit globular; stone smooth, not flattened, a little higher than broad (2.5 mm. high, 1.5 mm. broad).

Hab. Across the continent as far north as forests, and extending southward in damp cool woods to New Jersey, N. Indiana and Minnesota, and in the western mountains to Colorado and N. California.

Specimens examined: Alaska (*Kellogg* 90, 135), head of the Yukon (*Lt. Schwatka*), Unalaska (*Albatross Exped., Harrington*), Sitka (*Bongard, Bischoff*); British Columbia (*Tolmie, Wallace, Macoun*); Saskatchewan (*Bourgeau*); Labrador (*Turner, Mann, Stores, Anspach*); New Brunswick (*J. D. Smith, Osborn*); Maine (*Rounds, Redfield*); New Hampshire (*Meehan*); Vermont (*Pringle*); Massachusetts (*Oakes, Morong*); New York (*Clinton*); Pennsylvania (*Traill Green, Noll, Tenbroeck*); Ontario (*Macoun* 525, *Billings*); Michigan (*Clarke*); Wisconsin (*Douglass*); Colorado (*Parry* 437); Montana (*Watson*); Idaho (*Coulter*); Washington (*Wilkes' Exped.* 589, *Lyall*,

Suksdorf, G. R. Vasey 480); Oregon (*Durand*, Hall 220); California (*Bolanuer* 4776).

2. *C. Suecica* Linn. Spec. 118. Stems sometimes branching above, 5 to 25 cm. high: leaves sessile, all opposite, becoming smaller downwards, ovate or oval, acute, nerves all arising at or near the base, appressed-pubescent on both sides, uppermost leaves 1.2 to 3.8 cm. long, 1.2 to 1.8 cm. wide: peduncle 1.2 to 3 cm. long: involucre bracts 4, white or creamcolor, ovate, 6 to 12 mm. long: flowers dark purple: fruit globular; stone flattened, mostly with a shallow furrow on each face, acute, as broad as high (3 mm.).

Hab. From Newfoundland and Labrador to Greenland and Alaska.

Specimens examined: Labrador (*Stores*); Alaska (*Harrington*, *Dall*); Behring Straits (*Wright*); Kowak river (*McLenegan*); Norton Sound (*Bannister*); St. Paul, Kodiak Is. (*Beard* in 1889).

3. *C. Unalashkensis* Ledebour, Fl. Ross. 2. 378. "Leaves subequal, sessile, oblong, 5 to 7-nerved almost from the base; upper ones verticillate: umbel peduncled, involucre: calyx-teeth ovate-lanceolate, acute."

Hab. Island of Unalaska. Collected by Eschscholtz and Chamisso. The species is included in Rothrock's Fl. Alask., not as having been collected by him, but as having been reported to occur.

We have seen no specimen of this species, and simply translate Ledebour's description. In his remarks upon the species he says: "It differs from *C. Suecica* in its upper leaves being verticillate; from *C. Canadensis* in its leaves being 5 to 7-nerved and all nearly equal (the lower ones not much smaller); from both in its narrower leaves and in its calyx-teeth being longer, narrower and more acute." The flower and involucre leaves were unknown to the author.

++ Shrubs or trees.

4. *C. florida* Linn. Spec. 117. From a low shrub (towards its northern limits) to a tree 9 to 12 meters high (at the south): petioles 5 to 18 mm. long; leaves ovate or elliptical, occasionally somewhat obovate, acuminate, mostly acute at base, minutely appressed-pubescent above, whitish beneath and with sparse mostly appressed-pubescent, 6 to 14 cm. long, 3.5 to 9 cm. wide: involucre bracts 4, white often tinged with red, obcordate or with callous notch at apex, 1.2 to 5 cm. long, 1.2 to 4 cm. wide; head of flowers 6 to 14 mm. in diameter: fruit ovoid, crowned with a narrow persistent calyx; stone ovoid, smooth, 6 to 8 mm. high, 4 to 5 mm. broad.

Hab. From Southern New England, Ontario, and Minnesota, to Florida and Texas.

Specimens examined: Ontario (*Macoun* 101); Michigan (*Clarke*); Indiana (*Coulter, Thomson, Evans*); Ohio (*Sullivan*); Pennsylvania (*Porter, Martindale, Miss Davis*); Maryland (*J. D. Smith*); District of Columbia (*Parry, G. R. Vasey*); Virginia (*A. H. Curtiss*); West Virginia (*J. D. Smith*); South Carolina (*M. A. Curtiss*); Georgia (*G. R. Vasey*); Mississippi (*Whinery*); Texas (*Hall* 266); Indian Territory (*Palmer* 158); Arkansas (*Bigelow*).

5. *C. Nuttallii* Audubon, Birds, t. 467. Resembling the last but becoming taller (15 to 24 meters high): petioles 6 to 25 mm. long; leaves mostly obovate, generally woolly pubescent beneath and with intermixed appressed hairs: involucre bracts 4 to 6, narrowly oblong to obovate or even round, obtuse, abruptly acute, or acuminate, larger (3.5 to 7.5 cm. long, 1.8 to 6 cm. wide); head of flowers larger, 1.4 to 2 cm. in diameter: fruit crowded among abortive ovaries, crowned with the broad persistent calyx, larger; stone 8 to 10 mm. high, 7 to 8 mm. broad.

Hab. From British Columbia and Vancouver Island, through the Pacific States to Southern California.

Specimens examined: British Columbia, Frazer river (*Lyall, Macoun* 528); Buzzard Inlet (*Macoun*); Vancouver's Island (*Wood*); Washington (*Wilkes's Exped., Suksdorf, Brown, G. R. Vasey* 141); Oregon (*Tolmie, Hall* 219, *Howell* 176, *W. S. Carpenter* 121); California (*Hartweg* 1763, *Bolander* 3966, *Brewer* 1444, 2675, *Parry & Lemmon* 150, *J. G. Lemmon, Greene, Mrs. Ames, Mrs. Austin, G. R. Vasey*).

* * Flowers yellowish, in sessile umbels, appearing before the leaves, involucre with 4 small deciduous bracts: fruit dark blue.

6. *C. sessilis* Torr. in Durand Pl. Pratten. 89. Shrub 3 to 4.5 meters high with greenish bark: leaves short-petioled, approximate, ovate, short acuminate, nearly smooth above, pale beneath and with appressed and silky pubescence, 5 to 9 cm. long, 2.5 to 6 cm. wide: umbels terminal but becoming lateral by the development of the shoot; involucre bracts 6 to 8 mm. long, about as long as the slender silky pedicels: fruit oblong, 12 to 15 mm. long, 6 to 10 mm. broad; stone oblong, somewhat pointed and longitudinally ridged, 9 to 11 mm. long, 4 to 5 mm. broad.

Hab. Wet ravines and foothills, Northern California.

Specimens examined: California. with no station (*Pratten, Bigelow, Bolander, Mann, Parry* 776, *G. R. Vasey*); Upper Sacramento (*Hooker & Gray, Greene*), American river (*State Survey* 204), McCloud's River (*Lemmon*), Placer county (*G. R. Vasey*), Butler county (no collector indicated), Humboldt county (*Rattan*).

In previous descriptions mature fruit has not been described. Specimens collected by Drs. Hooker and Gray, on the Upper Sacramento, show mature fruit and much larger than was expected. In the dried state the color is hard to determine, as the fruit then has the color of dried prunes. Our conclusion is that it is a dark blue, but it is barely possible that it may be a dark red.

* * * Flowers white or cream-colored, cymose, not involucrate : fruit white, lead-color, or blue.

+ Leaves opposite.

++ Lower leaf surface with more or less silky or woolly pubescence (except sometimes nos. 11 and 13).

(1) Stone pointed at base, more or less prominently ridged, flattened slightly or not at all, 5 to 7 mm. high, 4 to 7 mm. broad.

7. *C. Torreyi* Watson, Proc. Am. Acad. 11. 145. Shrubby, with slightly pubescent branches : branchlets and inflorescence pubescent : petioles slender, 12 to 18 mm. long ; obovate to oblanceolate or oblong, abruptly acute or shortly acuminate, appressed-pubescent above, paler and somewhat pubescent beneath with loose silky hairs, 3.5 to 6 cm. long, 1.8 to 3 cm. wide : cyme loose and spreading : calyx-teeth very minute : fruit white ; stone obovoid, somewhat compressed, oblique, acute at base (as if beaked), ridged on the edges, higher than broad (5 to 7 mm. high, 4 mm. broad).

Hab. Yosemite valley and mountains, California.

Specimens examined: Dr. Torrey's original collection of 1865, no other collection ever having been made. The leaves of this species are much like those of *C. pubescens*, but the stone is unlike any other with which we are acquainted. It is to be hoped that it may be rediscovered by some of our zealous Californian botanists.

8. *C. sericea* Linn. Mant. 2. 199. Shrub 1 to 3.5 meters high, with branches mostly purplish : branchlets and inflorescence silky-downy : petioles 1.2 to 3.7 cm. long ; leaves very variable, from lanceolate and narrowly ovate to broadly ovate and elliptical, mostly long acuminate, rounded or acute at base, nearly glabrous above, whitish and silky-(often rusty-) pubescent beneath (rarely glabrate), 2.5 to 12.5 cm. long, 2.5 to 8.5 cm. wide : flowers in broad rather compact cymes : calyx-teeth conspicuous (the largest of the genus) : style abruptly and conspicuously swollen at tip : fruit pale blue ; stone oblique and irregular, more or less pointed at base, longitudinally and irregularly sharp ridged, mostly

broader than high (5 to 6 mm. high, 4 to 7 mm. broad).—*C. lanuginosa* Michx. *C. obliqua* Raf.

Hab. Wet ground, from New Brunswick to Florida and westward to Dakota and Texas.

Specimens examined: Vermont (*Pringle*); Connecticut (*Eaton*); New York (*Gray*, *L. F. Ward*); Pennsylvania (*Porter*, very broad-leaved forms, *T. P. James*, *Martindale*, *Coulter*); New Jersey (*Martindale*); Maryland (*J. D. Smith*); District of Columbia (*Chickering*, *Ward*, *Seaman*); Virginia (*Curtiss*); North Carolina (no collector given); South Carolina (*Mrs. Thompson*); Georgia (*Rugel*); Ontario (*Burgess*, *Macoun*); Michigan (*Clarke*); Wisconsin (*Douglas*, *Mrs. Luce*); Illinois (*Bryce*, *Brendel*, *Wolf*); Iowa (*Burgess*); N. Texas (*Bigelow*).

Certain forms of this variable but very distinct species seem to have been mistaken by collectors for *C. stolonifera*; but even when the pubescence character is lacking, the prominent calyx teeth, the conspicuously swollen style-tip, and the large oblique irregularly and prominently ridged stone will serve to distinguish it with certainty.

(2). Stone globular or nearly so, mostly not at all ridged, 3 to 5 mm. in diameter.

9. *C. circinata* L'Her. Corn. 7. Shrub 1 to 3 meters high, with smooth greenish branches: branchlets and inflorescence appressed-pubescent: petioles about 12 mm. long; leaves round-oval, abruptly short-acuminate, minutely appressed-pubescent above, whitish and woolly beneath, 7.5 to 14 cm. long, 5 to 12 cm. wide: flowers in rather small compact cymes: calyx-teeth small: fruit light blue; stone spherical, not furrowed, small (3 mm. in diameter).—*C. rugosa* Lam. *C. tomentulosa* Michx.

Hab. From Nova Scotia to the mountains of Virginia, westward through the region of the Great Lakes to Iowa and the Winnipeg Valley.

Specimens examined: Maine (*Young*); Vermont (*Pringle*); Massachusetts (*Sears*); New York (*Gray*, *Mertz*, *Martindale*); Pennsylvania (*Porter*, *Martindale*); District of Columbia (*Conant*); Ontario (*Macoun* 531); Michigan (*Pitcher*, *Clarke*); N. Illinois (*Babcock*); Wisconsin (*Douglas*); Winnipeg Valley (*Bourgeau*).

10. *C. asperifolia* Michx. Fl. 1.93. Erect shrub 1 to 4.5 meters high, with reddish-brown mostly pubescent branches: branchlets and inflorescence rough pubescent: petioles 3 to 18 mm. long; leaves from narrowly ovate to round-ovate and oblong, from short to conspicuously acuminate, acute or obtuse at base, rough pubescent above, whitish and roughish woolly beneath, 3.5 to 12.5 cm. long, 1.8 to 7.5 cm. wide: flowers in loose mostly broad often paniculate cymes: calyx-teeth small:

fruit white on red stalks; stone not compressed, occasionally somewhat oblique, with a slightly furrowed edge, but little broader than high (about 4 mm. in diameter).

Var. Drummondii. Leaves harsher and usually more crowded: stone smaller, broader than high (hardly 3 mm. high).—*C. Drummondii* C. A. Meyer.

Hab. From Ontario to Iowa, southward to South Carolina, Florida and Texas.

Specimens examined: Ontario, Point Pelee (*Macoun*); Ohio (*Riddell*); Indiana, New Albany (*Clapp*), Crawfordsville (*Thomson, Evans*); Illinois, Oquawka (*Patterson*), Canton (*Wolf*), Athens (*Hall*), Peoria (*Brendel*); Missouri, St. Louis, (*Engelmann, Eggert*); Kansas, Ellis (*L. Watson*); Arkansas, Ft. Smith (*Bigelow*); Indian Territory (*Palmer* 154); Texas (*Berlandier* 340, 352, 2545, *Lindheimer* 153, 318), Houston (*Hall* 264), Dallas (*Reverchon* 379, 1053), Austin (*Rugel*), Harrisburg (*Joor* 128); Louisiana (*Nuttall, Hale*); Tennessee, Memphis (*Fendler*); South Carolina, "Santee Canal" (*Ravenel*); Florida (*Chapman*).

Although this species may usually be recognized by the roughness of the upper leaf-surface, the most certain characters are to be found in the stone, which separates it from any species with which it is likely to be confused. The stone approaches that of *C. candidissima*, but it is not so globular, and the character of the leaf pubescence would not permit these two species to be confounded. It is hardly safe to separate the var. *Drummondii* from the species without mature fruit, although nearly all the forms we have examined from the southwest (from St. Louis southward) seem to be the variety.

II. C. Greenei. Apparently with the habit of *C. pubescens*, with smooth more grayish branches: branchlets and inflorescence appressed-pubescent: petioles 6 to 12 mm. long; leaves from ovate or obovate to roundish oblong, abruptly acute or somewhat acuminate, acutish or rounded at base, appressed-pubescent to glabrate above, but little paler beneath and with an intermingling of woolly and straight rigid appressed hairs, 2.5 to 6 cm. long, 1.8 to 3.5 cm. wide: flowers large, in loose paniculate cymes: calyx-teeth triangular: styles with swollen green tips: fruit dark blue; stone globular, not furrowed, apt to be slightly ridged, 4 to 5 mm. in diameter.

Hab. California, from the University collection, with no locality noted.

This apparently very distinct species is most nearly related to *C. pubescens*, but its pubescence, large flowers in paniculate cymes, remarkable styles, and globular stone, furnish as distinct a set of specific charac-

ters as is to be found among species of *Cornus*. The species is dedicated to Professor E. L. Greene, who has kindly furnished the material.

(3) Stone flattened, with furrowed edges, and broader than high, 3 to 4 mm. high, 4 to 6 mm. broad.

12. *C. pubescens* Nutt. Sylva, 3.54. Shrub 1.8 to 4.5 meters high, with smooth purplish branches: branchlets and inflorescence more or less hirsute: petioles 6 to 25 mm. long; leaves from narrowly to broadly ovate or oval, acute or somewhat acuminate (rarely obtuse), mostly acute at base, appressed-pubescent or glabrate above, whitish and silky pubescent beneath, 2.5 to 12 cm. long, 1.2 to 7.5 cm. wide: flowers in more or less compact cymes: calyx-teeth minute: fruit white; stone somewhat compressed, mostly oblique, with a more or less prominently furrowed edge, about 4 mm. high and 5 mm. broad, the sides apt to have more or less prominent ridges. (Occasionally the stones become higher than broad from the base being drawn out or beaked, thus approaching *C. Torreyi*.)

Var. *Californica*. Leaves more apt to be rounded at base: stone smaller, but 4 mm. broad.—*C. Californica* C. A. Meyer.

Hab. From Southern California to Vancouver Island and British Columbia.

Specimens examined: California (Nuttall, Bolander, Torrey, Parry 67 in part, Brewer 102, 434, Nevin, Kellogg and Harford 323, Greene, Lemmon 694, Pulmer 98, 116, Pringle of 1882, Mrs. Ames, Jones, G. R. Vasey, etc.); Oregon (Lyall, Holl 221, Kellogg & Harford 322, Howell 177); Washington (Cooper, G. R. Vasey 226); Vancouver Island (Lyall, Macoun, Cowley); British Columbia, Thompson river (Fletcher), Columbia Valley (Macoun).

We can discover no good specific characters to separate *C. Californica* from *C. pubescens*, and must consider the former to be a rather poorly distinguished variety of the latter. The Rocky mountain species heretofore frequently referred to *C. pubescens* is *C. stolonifera*. For remarks as to the affinities of this species see under *C. stolonifera*.

13. *C. Baileyi*. Erect shrub, with reddish-brown mostly smooth branches: branchlets and inflorescence pubescent to woolly: petioles 6 to 25 mm. long; leaves from lanceolate to ovate, acute or short acuminate, acute or obtuse at base, appressed-pubescent to glabrate above, white beneath and with woolly hairs variously intermingled with appressed ones (or in some cases all appressed), 2.5 to 12 cm. long, 1.2 to 7.5 cm. wide: flowers in small rather compact cymes: calyx-teeth from small to prominent: fruit white; stone decidedly compressed,

flat-topped, rarely oblique, with a very prominently furrowed edge, much broader than high (3 mm. high, 4 to 6 mm. broad).

Hab. About the Great Lakes and westward to head waters of the Saskatchewan and Wyoming.

Specimens examined : Presque Isle (Garber); Point Pelee (Macoun 102); Michigan, South Haven (L. H. Bailey); Minnesota, north shore of Lake Superior, Vermillion Lake, and Hunter's Island (L. H. Bailey 12, 36, 250); Lake Nipigon (Macoun 2242); Lake Winnipeg Valley and the Saskatchewan (Bourgeau, Dawson); N. W. Territory, Cypress Hills (Macoun 149); Wyoming Territory, near Ft. Bridger (Porter, distributed as *C. pubescens*).

This species has been confused with *C. stolonifera*, *C. sericea*, and *C. pubescens*, and it certainly bears no little resemblance to *C. asperifolia*. The appressed-pubescent was taken to indicate *C. stolonifera*, and the woolly hairs were thought to point to *C. sericea* or *C. pubescens*. It differs from *C. asperifolia* in its mostly glabrate upper leaf-surface, white lower leaf-surface, and much compressed deeply furrowed stone, which is much broader than high. It differs from *C. stolonifera*, with which it has been mostly confused in herbaria, not only in the woolliness of the lower leaf-surface, but very strikingly in the stone characters just enumerated. It resembles *C. sericea* so little that a statement of the differences would be a repetition of all the specific characters. Its stone most resembles that of the western *C. pubescens*, but it is larger and more compressed and the pubescence of the leaves is entirely different. For further discussion of relationships see under *C. stolonifera*. The range is very obscure as yet. We suspect that it extends far to the northwest in British America, and probably descends again into the United States along the Rocky Mountain and Pacific ranges to still further increase the confusion of species in our extreme northwestern states. Only an extensive collection of fruiting specimens can settle this question, for the combination of pubescence and stone characters can not fail to distinguish *C. Baileyi*. We dedicate the species to Professor L. H. Bailey, whose abundant material from Michigan and Minnesota has enabled us to characterize it, and who also has called attention to it in his remarks under *C. stolonifera* in Bulletin 3, Minn. Geol. and Nat. Hist. Survey, p. 14.

Crawfordsville, Ind.